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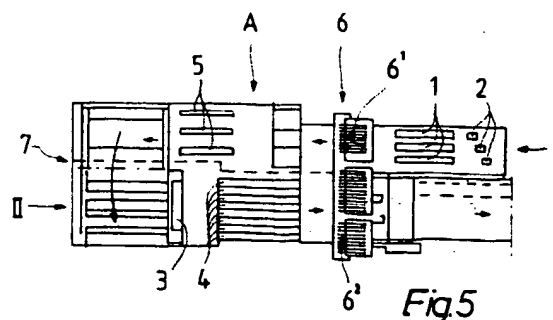
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⑤④ Apparatus for manufacturing or assembling load pallets constructed of wood.

⑤⑦ Apparatus for manufacturing or assembling load pallets constructed of wood from pre-sawed blanks/pieces, said apparatus comprising a first assembly line (I) for assembling the runners (5) of the load pallet of foot boards (1) and intermediate props (2), and a second assembly line (II) for assembling the load pallet of runners (5), intermediate boards (3) and deck boards (4), and each line (I and II) comprising nailing means (6', 6''). The first assembly line (I) and the second assembly line (II) are disposed side by side so that the transporting direction of the second assembly line (II) is opposite relative to that of the first assembly line (I); that the apparatus comprises a transport means (7) disposed to transport the runners (5) assembled on the first assembly line (I) to the second assembly line (II); and that the nailing means (6', 6'') of the lines (I and II) are combined to constitute one single nailing means entity (6).



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The present invention concerns apparatus such as is defined in the preamble to Claim 1.

The object of the invention is to provide apparatus of a novel type to serve the manufacturing or assembly of load pallets constructed of wood, from presawn blanks/pieces.

It is, in addition, an object of the invention to provide apparatus thanks to which the floor area required by the entire apparatus is less than in the case of apparatus of prior art.

It is furthermore an object of the invention to provide apparatus which presents high production capacity.

It is, in addition, an object of the invention to provide apparatus with which a load pallet can be assembled faster than with any apparatus of prior art.

It is further an object of the invention to provide apparatus which is continuously operating and which can be automated.

The apparatus of the invention is characterized by that which is stated in Claim 1.

The apparatus of the invention comprises a first assembly line for assembling the runners of the load pallet from foot boards and spacer props; and a second assembly line for assembling the load pallet from the runners, intermediate boards and deck boards. As taught by the invention, the first assembly line and the second assembly line are disposed paralleling each other so that the transporting direction of the second assembly line is opposed to that of the first the apparatus comprises a transport means disposed to transport the runners assembled on the first assembly line to the second assembly line; and the nailing means of said lines are combined to constitute one single nailing means entity. The ultimate end of the first assembly line is thus in register with the initial end of the second assembly line. The nailing means is an expensive and comparatively complicated machine.

The great advantage afforded by the invention is that in the apparatus, with assembly lines arranged in parallel, all nailing can be carried out with a single nailing machine concentrated in one frame.

It is an advantage of the invention that the floor area which the apparatus requires is less than in any apparatus of prior art, because the first and second assembly lines are placed side by side.

It is a further advantage of the invention that the production capacity of the apparatus is high, and that a load pallet can be assembled faster than with any apparatus of prior art.

It is moreover an advantage of the invention that the apparatus can be made inexpensive because there is no need to provide a plurality of separate nailing machines.

In the following the invention is described in detail with reference to the attached drawing, wherein

Fig. 1 presents, viewed obliquely from above and in axonometric projection, the overall view of an

embodiment of the apparatus A according to the invention, with its after-treatment apparatus;

Fig. 2 presents the layout of the apparatus of Fig. 1, seen from above;

Fig. 3 presents, in axonometric projection obliquely from above, a standard load pallet;

Fig. 4 presents the load pallet of Fig. 3 in exploded view;

Fig. 5 presents the apparatus A, seen from above and enlarged from Fig. 2;

Fig. 6 presents in perspective, the first assembly line, viewed obliquely from one side, from the initial end;

Figs 7 and 8 illustrate, in elevational view and schematically, by steps, the operation of the conveyor of the first assembly line;

Fig. 9 shows the section IX-IX of Fig. 8;

Fig. 10 schematically presents the apparatus A without transport means, viewed from the side and obliquely from above from the side of the ultimate end of the first assembly line, illustrating the transporting, and inverting, of the runners from the first assembly line to the second assembly line;

Fig. 11 shows the transport means, set in gripping position on the first assembly line side;

Fig. 12 presents, in perspective and viewed from one side and obliquely from above, the second assembly line without intermediate board and deck board cassettes;

Fig. 13 presents in elevational view the conveyor of the second assembly line, viewed in a direction other than that of Fig. 12;

Fig. 14 schematically presents the section through a deck board cassette from which the deck board dog is in contact with a deck board;

Fig. 15 presents, in perspective, the nailing means entity, seen obliquely from one side;

Fig. 16 schematically presents the nail magazine, sectioned and in elevational view, and the clinching means after a clinching operation.

In Fig. 1 is depicted, as viewed obliquely from above, an axonometric overall view of an apparatus intended to be used in manufacturing or assembling load pallets constructed of wood, such as standard load pallets, from pre-sawn pieces of timber. In Fig. 2 is depicted a top view of the same apparatus. The invention actually concerns the apparatus encircled with a dot-and dash line A. This apparatus manufactures a load pallet of its components. The other apparatus units B, C, D, E, F and G are provided for further treatment of the load pallet. B is a branding station comprising six branders with which the requisite pallet identification markings are made on the load pallet. C is a foot board milling station by which the parts between the spacer props of the foot boards are milled, simultaneously on either side of the pallet. D is a mitre sawing station where four circular saws cut the cor-

ners of the pallet, simultaneously. E is a pallet turning station where, when required, the pallet is turned about. F is a pallet bundling station which stacks the pallets in a bundle and moves a turned pallet for crosswise piling. G is a completed bundle conveyor. The total length of the line including the after-treatment apparatus is about 25 metres.

The length of the apparatus unit A is about 8 m and its breadth, 2.3 m. The capacity of this apparatus is 2000 pallets per eight hours. The apparatus is operated by three workers, who load pre-sawed blanks, or various components of the load pallet, in their respective cassettes. Around the apparatus A, intermediate stores for blanks, H, are provided, and the requisite controls are concentrated in the control/electric desk J containing control logics and manual operating switches.

The apparatus of this exemplary embodiment is disposed to assemble standard load pallets of sizes 1200 x 800 and 1200 x 1000.

In Figs 3 and 4 is depicted, in fully assembled condition, a typical load pallet that can be assembled with the apparatus A of the invention, Fig. 3, and the same in exploded view presentation, Fig. 4. The load pallet comprises three foot boards 1, mutually parallel and spaced from each other; three intermediate props 2 for each foot board 1, these intermediate props 2 being arranged with equal spacing over the length of each foot board 1; three intermediate boards 3, fixed upon the intermediate props 2 transversely relative to the foot boards 1; and a plurality of deck boards 4 which are nailed fast to the intermediate boards 3, upon these.

It should be noted that many kinds of load pallets can be manufactured, within the scope of the present inventive idea, with this apparatus by suitably modifying same, which pallets would have a number of foot boards 1, intermediate props 2, intermediate boards 3 and deck boards 4 differing from the example just presented. For the deck boards can be substituted, for instance, a coherent sheet. Likewise, the dimensions and proportions of the components mentioned may be different from those in the example.

Fig. 5 reveals that the apparatus A comprises a first assembly line I and a second assembly line II. The first assembly line I and the second assembly line II are disposed side by side so that the transport direction of the second assembly line II is opposite to that of the first assembly line I. The transport direction on the lines I and II is indicated with heavy arrows. The apparatus further comprises a transport means 7, arranged to transport the runners 5 assembled on the first assembly line I over to the second assembly line II. The nailing means of lines I and II, 6<sup>1</sup> and 6<sup>2</sup>, are combined in a single nailing means entity 6. On the first assembly line I, the intermediate props 1 are with the aid of the nailing means 6<sup>1</sup> nailed together with the foot boards 2 so that the intermediate props 1 are lo-

cated under the foot boards 2, whereby the said runner 5 is formed. At the end of the first assembly line, between lined I and II, a transport means 7 has been provided, by which the runners 5 are moved and turned 180° to the beginning of the second assembly line II in such manner that the foot boards 2 are now below and the intermediate props 1 are on top. The runners 5 are then moved on the second assembly line II, in the opposite direction relative to the first assembly line I, towards the nailing means 6<sup>2</sup>, prior to which the intermediate boards 3 are placed transversely upon the intermediate props and the deck boards 4 are placed lengthwise upon the intermediate boards 3, all these being finally nailed together with the aid of the nailing means 6.

Fig. 6 reveals some of the design of the first assembly line I, as seen from the initial end of the line. The first assembly line I comprises, first, intermediate prop cassettes 8, in which the intermediate props 2 are stacked one upon the other. Since this exemplary apparatus turns out load pallets with three runners 5, three intermediate prop cassettes 8 have been provided side by side. After them follows the same number, that is three, foot board cassettes 9 side by side, the foot boards 1 being stacked in these cassettes, longitudinally in relation to the direction of transport. Furthermore, the first assembly line comprises a first conveyor 10, disposed to run past below the intermediate prop cassettes 8 and the foot board cassettes 9, to pick up intermediate props 2 and foot boards 1 from the intermediate prop cassettes 8 and the foot board cassettes 9. The conveyor 10 further transports the runners 5, lying side by side, to the nailing station 6<sup>1</sup> so that the foot board 1 lies upon the intermediate props 2 and the intermediate props 2 are spaced by a given distance in the longitudinal direction of the foot board 1.

The first assembly line further comprises, after the nailing means 6<sup>1</sup>, an auxiliary conveyor 11 (see Fig. 10), disposed to receive the nailed runners 5 from the nailing station 6<sup>1</sup>, to move the runners 5 transversely to lie at a spacing consistent with the spacing of the runners on the completed load pallet, and furthermore to transport the runners 5 longitudinally into reach of the transport means 7.

Referring to Figs 6 to 9, we shall now describe the cooperation of the intermediate prop cassettes 8, the foot board cassettes 9 and the conveyor 10. The first conveyor 10 is a chain conveyor comprising a pair of sprocket chains 12<sup>1</sup> and 12<sup>2</sup>, a pair of deflection wheels 13<sup>1</sup>, 13<sup>2</sup> and a pair of traction wheels 14<sup>1</sup>, 14<sup>2</sup>. Each chain, 12<sup>1</sup> and 12<sup>2</sup>, travels in an endless run over the deflection wheels 13<sup>1</sup>, 13<sup>2</sup> and the traction wheels 14<sup>1</sup>, 14<sup>2</sup>. The deflection wheel pair and the traction wheel pair are horizontally spaced from each other.

The conveyor 10 comprises intermediate prop dogs 15, or crossbars 18, connected to the traction

members 12<sup>1</sup> and 12<sup>2</sup> with such spacing in the transport direction as corresponds to the spacing of the intermediate props on the completed runner 5, or on the load pallet. Said intermediate prop dogs take intermediate props 2 along with them from the intermediate prop cassettes 8. Each intermediate prop cassette 8 includes a retainer means 100 which retains the lowermost intermediate prop 2 in its cassette, until it allows this intermediate prop to drop onto the conveyor at the proper moment.

If the number of intermediate props 2 belonging on one runner 5 is three, then every third intermediate prop dog crossbar 18 is provided with a row of pins 19, which serve as foot board dogs 17. In Fig. 7 the situation is depicted in which the crossbars 18 are in the process of taking along intermediate props 2. The crossbar which is last in the direction of transport is at best passing through below the intermediate prop cassette 8. In Fig. 8 the conveyor 10 has moved onward a bit, whereby the pin on said last crossbar 18 is in contact with the lowermost foot board 1 in the foot board cassette 9 and proceeds to push this board ahead of itself and out from the cassette, whereby the board is deposited upon the preceding intermediate props 2, in correct position.

Fig. 9 shows the section IX-IX of the foot board cassette 9 of Fig. 8. In this figure is seen the crossbar 18, which is attached to the traction members 12<sup>1</sup> and 12<sup>2</sup>. Three pins 19 project upwards from the crossbar 18. The foot board cassette 9 comprises supporting flanges 20<sup>1</sup>, 20<sup>2</sup> for carrying the stack of foot boards. Between said supporting flanges is left a slot 21 longitudinal to the cassette 9, and this slot is disposed to receive in itself the pin 19 and the pin 19 can move in the slot through the entire cassette.

Runners are made simultaneously, side by side, as many as the completed load pallet is meant to have. The runners assembled in the way just described are carried on the conveyor 10 to the nailing means 6<sup>1</sup>; the conveyor 10 is repeatedly stopped for a moment while foot nails are driven from the side of the foot boards 1 through these boards into the intermediate props 2, in order to assemble the runners 5.

The entire apparatus A is schematically shown in Fig. 10, however omitting the transport means 7, which is presented in greater detail in Fig. 11. In the figure can be seen the auxiliary conveyor 11 belonging to the first assembly line I, this auxiliary conveyor receiving from the nailing means 6<sup>1</sup> the runners 5 produced from foot boards 1 and intermediate props 2 by nailing these together, whereafter the auxiliary conveyor 11 moves the runners 5 transversely relative to the transport direction to be spaced from each other as the runners are spaced in the completed load pallet, and transports the runners further in their longitudinal direction into reach of the transport means 7. It is thus understood that at the end of the first assembly line I the runners 5 are positioned with the intermedi-

ate props 2 downward and the foot boards 1 upward. In the completed load pallet they are positioned the other way around. Therefore, and in order that the nailing, with deck nails, taking place on the second assembly line and which serves to unite the deck boards 4 with the runners, might be feasible with the same nail-driving direction and with simultaneous nailing stroke, the runners have to be turned through 180°, i.e., inverted, as has been illustratively indicated in Fig. 10. This transport and inverting operation is accomplished with the transport means 7, shown in Fig. 11.

In Fig. 11 is depicted the transport means 7 by which the transport of the runners 5 and their simultaneous inverting is accomplished at the ultimate end of the first assembly line I, to deposit them at the beginning of the second assembly line II. In this figure the ultimate end of the first assembly line I is virtually indicated with dot-and-dash lines. The transport means 7 comprises gripping members 22 for gripping the runners 5, and an inverting means 23 to which said gripping members 22 are attached. The inverting means 23 is pivoted between the first assembly line I and the second assembly line II to be turnable about a turning axle 24 through more than 180°. The inverting means 23 includes a body frame 25, disposed to receive within itself the runners 5. The gripping members 22 include pushers 26<sup>1</sup>, 26<sup>2</sup> and 26<sup>3</sup>, operated by force means and disposed on one side of the body frame, and counter-members 27<sup>1</sup>, 27<sup>2</sup>, 27<sup>3</sup>, e.g. rubber stops, disposed on the body frame in register with the pushers so that the runners 5 can be longitudinally urged with the pushers against said counter-members in order to achieve a firm grip on the runners, so that their lifting and inverting can be accomplished. With a transport means 7 of this kind, the spacing of the runners is maintained unchanged during transport and inverting. The inverting means 23 further comprises turning arms 28, the body frame 25 being fixed in the fork formed by these arms. The turning arms 23 are joined to each other with a shaft. On the end of the shaft a gear wheel is provided which meshes with a tooth rack, this tooth rack being movable by the aid of a power member, in order to swivel the turning means reciprocatingly between the first and second assembly lines.

The transport means 7 is so controlled that it supports the runners 5 on a given height above the conveyor 31 of the second assembly line II in stand-by until the dogs of the conveyor 31 of the second assembly line II have come into correct position, so that the runners 5 can be lowered down on the conveyor 31 of the second assembly line II with proper timing.

Figs 10, 12 and 13 illustrate the arrangements provided on the second assembly line II.

After the runners 5 have been inverted and brought to the beginning of the second line, they are again transported with the aid of a chain conveyor 31.

This conveyor includes dogs disposed in such a way that, first, the intermediate boards 3 will be deposited in proper positions upon the intermediate props 2 and, further, the deck boards 4 will be deposited in proper positions upon the intermediate boards 3.

The second assembly line II comprises one transversal intermediate board cassette 29, in which the intermediate boards 3 are stacked, transversely relative to the transporting direction of the line II. Thereafter follow deck board cassettes 30, in which the deck boards 4 are stacked, parallelling the transporting direction of the line. The number of deck board cassettes 30 equals the number of deck boards on one completed load pallet. Furthermore, the second assembly line II comprises a chain conveyor 31, disposed to run below the intermediate board cassette 29 and the deck board cassettes 30 and to pick up intermediate boards 3 from the intermediate board cassette 29 to be deposited upon the intermediate props 2 on the runners 5, and to pick up deck boards 4 from the deck board cassettes 30 to be deposited upon the intermediate boards 3. Hereafter, the conveyor 31 transports the runners and the intermediate and deck boards to the nailing means 6<sup>2</sup>, to cause them to be nailed together.

Figs 12 and 13 reveal the way in which the conveyor 31 is composed. It comprises a pair of endless traction members 32<sup>1</sup>, 32<sup>2</sup>, or sprocket chains, a pair of deflection wheels 33<sup>1</sup>, 33<sup>2</sup>, and a pair of traction wheels 34<sup>1</sup>, 34<sup>2</sup>. As in the conveyor of the first assembly line I, here too the deflection wheel pair and the traction wheel pair are disposed with a horizontal spacing, and the traction member pair is disposed to run around the deflection wheel pair and the traction wheel pair, which is driven by a power means 35.

The conveyor 31 comprises intermediate board dogs 36, connected to both sprocket chains 32<sup>1</sup>, 32<sup>2</sup> with such spacing in the transporting direction which is consistent with the spacing of the intermediate boards 3 on a load pallet, and they are disposed to pick up intermediate boards 3 from the intermediate board cassette 29. The conveyor further comprises deck board dogs 37, connected to the traction members for picking up deck boards 4 from the deck board cassettes 30.

The chains 32<sup>1</sup>, 32<sup>2</sup> are provided, at opposed points, with triangular intermediate board dogs 36, by which the intermediate boards 4 are picked up from the cassette 29 and deposited at their proper locations. The triangular dogs 36 are pivotally carried on the chains, and they include a guide follower 37, which in cooperation with a guide rail 38 on the side of the conveyor turns the dog into pick-up position at the right point, immediately before the intermediate board cassette 29. There are two triangular intermediate board dogs, one after the other, and their spacing is consistent with the spacing of the intermediate props 2 on the runner 5.

In its position at rest, the intermediate board dog lies parallel to the traction member, beside the traction member and outside the conveyor, so that it is out of the way when it is not needed. In its operating position, the intermediate board dog is turned transversely relative to the traction member so that it will push an intermediate board 3 out from the intermediate board cassette 29 when it comes to the cassette.

As can be seen in Fig. 13, the two intermediate board dogs 36<sup>1</sup>, 36<sup>2</sup> which face the plurality of runners first in the transporting direction are turnable, and the third intermediate board dog 36<sup>3</sup> is an elongated crossbar 39, transversely attached to the traction members 32<sup>1</sup>, 32<sup>2</sup>, between them, and arranged to push the runners 5 ahead of itself.

Figs 13 and 14 reveal that, like the foot board dogs of the line I, the deck board dogs 37 also consist of pins 40 attached to a crossbar 39. The number of these pins 40 equals that of deck board cassettes 30 provided side by side. Each deck board cassette 30 comprises supporting flanges 41, for carrying the stack of deck boards, and between these supporting flanges 41 remains a slot 42 longitudinal to the cassette 30, disposed to receive in itself the pin 40. Each pin 40 pushes one deck board 4 at a time, in the longitudinal direction thereof, out from each foot board cassette 30 and down upon the intermediate boards 3. After all components have in this way been properly positioned, they are transported to the nailing means 6<sup>2</sup>, which constitutes one single nailing means entity 6 together with the nailing means 6<sup>1</sup> which is used on the first assembly line I.

In Fig. 15 is seen the nailing means entity 6 composed of the nailing means 6<sup>1</sup> and 6<sup>2</sup> of the first and second assembly lines, I and II, respectively. The nailing means entity 6 comprises a frame 46, an upper beam 47, vertically guided to be movable relative to the frame, two hydraulic cylinders 48, connected between the upper beam 47 and the frame 46 and with which a vertical nailing stroke of the upper beam is accomplished. To the upper beam 47 are connected, in the present apparatus, about thirty nailing rams 49 and an equal number of side-by-side nail magazines 50. The nail magazines 50 are carried on the frame 46. The nailing means entity further comprises nail supply stores 53, or nail boxes, and feeding means 54 for feeding nails from these nail boxes into the nail magazines 50.

Fig. 16 shows one nail magazine 50 of the nailing means 6<sup>2</sup>. The nail magazine 50 comprises a guide 51 in which the nailing ram 49 can move, and a feeder guide 50 for feeding nails into nailing standby position to be ready to be rammed. The figure depicts the situation in which a deck nail 200 has been driven with the ram 51 through the deck board 4 and the intermediate board 3. The clenching means 43 bends the points of the deck nails 200 that have been driven through the deck and intermediate boards, back into

the intermediate board 3. In order to accomplish this, the clenching means 43 comprises a bender plate 44 and, for horizontally moving same, a hydraulic cylinder 45. The bender plate 44 is configured to have transversely consecutive triangular ridges, the side faces of any two adjacent ridges cooperating to bend the nail as the plate is being moved and forming the nail into hook shape.

In the nailing machine the nailing takes place one row at a time in accordance with the nailing pattern, and therefore the nailing magazines 50 are disposed to be movable as may be required for the desired nailing pattern. The conveyor 31 stops the load pallet for a brief moment for the nailing of each row.

After passing through the nailing means, the load pallet is one completely assembled entity, and it goes to the inspection station B, where the quality and acceptability of the pallet can be visually assessed. If the pallet is defective, it can be removed from the line at this station. In any other case the pallet proceeds into storage and/or to further treatments in stations C to G (Fig. 1).

The invention is not confined to concern merely the embodiment examples presented in the foregoing; numerous modifications are feasible while staying within the scope of the inventive idea defined by the claims.

## Claims

1. Apparatus for manufacturing or assembling load pallets constructed of wood from pre-sawed blanks/pieces, said apparatus comprising a first assembly line (I) for assembling the runners (5) of the load pallet of foot boards (1) and intermediate props (2), and a second assembly line (II) for assembling the load pallet of runners (5), intermediate boards (3) and a deck element, such as deck boards (4), and each line (I and II) comprises nailing means (6<sup>1</sup>, 6<sup>2</sup>), characterized in that the first assembly line (I) and the second assembly line (II) are disposed side by side so that the transporting direction of the second assembly line (II) is opposite relative to that of the first assembly line (I); that the apparatus comprises a transport means (7) disposed to transport the runners (5) assembled on the first assembly line (I) to the second assembly line (II); and that the nailing means (6<sup>1</sup>, 6<sup>2</sup>) of the lines (I and II) are combined to constitute one single nailing means entity (6).
2. Apparatus according to claim 1, characterized in that the first assembly line (I) is disposed to assemble the runners (5) of the load pallet simultaneously and side by side so that the foot board (1) of each runner (5) lies upon the intermediate props (2); and that the transport means (7) is disposed in connection with transport to invert the runners 180° relative to the longitudinal axis, whereby on the second assembly line (II) the runners (5) are in a position in which the foot boards (1) are below the intermediate props (2).
3. Apparatus according to claim 1 or 2, characterized in that the first assembly line (I) comprises
  - a plurality of intermediate prop cassettes (8), in which the intermediate props (2) are stacked, and the number of these intermediate prop cassettes being equivalent to the number of runners (5) on the completed load pallet,
  - a plurality of foot board cassettes (9), in which the foot boards (1) are stacked to lie parallel with the transporting direction of the line, and the number of these foot board cassettes being equivalent to the number of runners (5) on the completed load pallet,
  - a first conveyor (10) disposed to run below the intermediate prop cassettes and the foot board cassettes for picking up intermediate props and foot boards from the intermediate prop cassettes (8) and the foot board cassettes (9) and to transport them to a nailing station (6<sup>1</sup>) in such manner that the foot board (1) lies upon the intermediate props (2) and the intermediate props are spaced from each other in the longitudinal direction of the foot board.
4. Apparatus according to any one of claims 1-3, characterized in that the first assembly line (I) comprises an auxiliary conveyor (11) disposed to receive the nailed runners (5) from the nailing means (6<sup>1</sup>), to transport the runners in transversal direction to be spaced as the runners are on the completed load pallet, and to transport the runners longitudinally into reach of the transport means (7).
5. Apparatus according to claim 1 or 4, characterized in that the first conveyor (10) comprises
  - a pair of endless traction members (12<sup>1</sup>, 12<sup>2</sup>), such as sprocket chains,
  - a pair of deflection wheels (13<sup>1</sup>, 13<sup>2</sup>), such as a sprocket wheel pair,
  - a pair of traction wheels (14<sup>1</sup>, 14<sup>2</sup>), such as a sprocket wheel pair,
 said deflection wheel pair and said sprocket wheel pair being disposed with a horizontal spacing, and the traction member pair being disposed to run over the deflection wheel pair and over the traction wheel pair, which is driven by a power means (15).
6. Apparatus according to claim 5, characterized in

- that the first conveyor (10) comprises intermediate prop dogs (16) connected to the traction members (12<sup>1</sup>, 12<sup>2</sup>) with such spacing in the transporting direction which is equivalent to the spacing of intermediate props on the completed runner (5) or load pallet, and disposed to pick up intermediate props (2) from the intermediate prop cassettes (8), and foot board dogs (17) connected to the traction members (12<sup>1</sup>, 12<sup>2</sup>) for picking up foot boards (1) from the foot board cassettes (9).
7. Apparatus according to claim 6, characterized in that the intermediate prop dog (16) comprises an elongated first crossbar (18) or the like, attached transversely to the traction members (12<sup>1</sup>, 12<sup>2</sup>), between them; and that each intermediate prop cassette (8) is disposed to deliver one intermediate prop (2) at a time for the crossbar (18) to pick up.
8. Apparatus according to claim 6 or 7, characterized in that the foot board dogs (17) are pins (19) attached to the crossbar (18); and that the foot board cassette (9) includes supporting flanges (20<sup>1</sup>, 20<sup>2</sup>) for carrying the foot board stack, between said supporting flanges being provided a slot (21) longitudinal to the cassette, disposed to receive in itself a pin (19), the pin (19) being disposed to push one foot board (1) at a time in its longitudinal direction out from the foot board cassette (9) and down upon the intermediate props (2).
9. Apparatus according to any one of claims 6-8, characterized in that the intermediate prop dogs (16<sup>1</sup>, 16<sup>2</sup>) which are first facing in the transporting direction one runner set (5<sup>1</sup>, 5<sup>2</sup>, 5<sup>3</sup>) of the load pallet being manufactured on the first assembly line (I), before the last one, are crossbars (18) without pins (19), and the last intermediate prop dog (16<sup>3</sup>) is a crossbar provided with pins.
10. Apparatus according to any one of claims 1-9, characterized in that the transport means (7) comprises
- gripping members (22) for gripping the runners (5), and
  - an inverting means (23), to which the gripping members (22) are attached and which is pivoted between the first assembly line (I) and the second assembly line (II) to be turnable about a turning axis (24), for inverting the runners (5) and transporting them to the second assembly line (II).
11. Apparatus according to claim 10, characterized in that the inverting means (23) comprises a body frame (25) disposed to receive in itself the runners (5); and that the gripping members (22) comprise power means-operated pushers (26<sup>1</sup>, 26<sup>2</sup>, 26<sup>3</sup>) disposed on one side of said frame, and counter-members (27<sup>1</sup>, 27<sup>2</sup>, 27<sup>3</sup>) disposed in said body frame on the opposite side so that the runners (5) can be urged with the pushers against said counter-members.
12. Apparatus according to claim 10 or 11, characterized in that the inverting means (7) includes a turning arm (28) to which the body frame (25) is attached, and said turning arm being carried to be turnable about a turning axle (24).
13. Apparatus according to any one of claims 1-12, characterized in that the second assembly line (II) comprises
- an intermediate board cassette (29), in which the intermediate boards (3) are stacked transversely to the transporting direction of the line,
  - a plurality of deck board cassettes (30), in which the deck boards (4) are stacked in the transporting direction of the line, and the number of these deck board cassettes being equivalent to the number of deck boards on the final load pallet,
  - a second conveyor (31), disposed to run beneath the intermediate board cassette and the deck board cassettes, for picking up intermediate boards (3) from the intermediate board cassette (29) down upon the intermediate props (2) of the runners (5) and for picking up deck boards (4) from the deck board cassettes (30) down upon the intermediate boards (4) and for transporting them to the nailing station (6<sup>2</sup>) for nailing the runners and the intermediate and deck boards together.
14. Apparatus according to claim 13, characterized in that the second assembly line (II) comprises
- a pair of endless traction members (32<sup>1</sup>, 32<sup>2</sup>), such as a sprocket chain pair,
  - a pair of deflection wheels (33<sup>1</sup>, 33<sup>2</sup>), such as a sprocket wheel pair,
  - a pair of traction wheels (33<sup>1</sup>, 33<sup>2</sup>), such as a sprocket wheel pair,
- the deflection wheel pair and the traction wheel pair being disposed with a horizontal spacing, and the traction member pair being disposed to run over said deflection wheel pair and said traction wheel pair, driven by a power means (35).
15. Apparatus according to claim 14, characterized in that the second conveyor (31) comprises intermediate board dogs (36) connected to the traction members (32<sup>1</sup>, 32<sup>2</sup>) with such spacing in the transporting direction which corresponds to the spac-



ing of the intermediate boards (3) on the load pallet, and disposed to pick up intermediate boards (3) from the intermediate board cassette (29); and deck board dogs (40) connected to the traction members for picking up deck boards (4) from the deck board cassettes (30).

16. Apparatus according to claim 15, characterized in that the intermediate board dog (36) is pivotally carried on the traction member (32<sup>1</sup>, 32<sup>2</sup>) to be horizontally turnable between a position at rest and an active position, the intermediate board dog in its position at rest lying parallel relative to the traction member, beside the traction member and outside the conveyor, so that it is out of the way when not needed, and in its active position the intermediate board dog is turned to lie transversely to the traction member so that it will push an intermediate board out from the intermediate board cassette as it comes into register with the intermediate board cassette.

17. Apparatus according to claim 15 or 16, characterized in that the intermediate board dog (36) includes a guide follower (37) disposed in cooperation with a stationary guide rail (38) on the side of the conveyor (31) to turn the intermediate board dog into pick-up position before the intermediate board cassette, whereby when the row formed by the intermediate props of the runners (5) lying side by side comes under the intermediate board cassette the intermediate board dogs will turn, and push an intermediate board down upon the intermediate props.

18. Apparatus according to any one of claims 15-17, characterized in that the intermediate board dogs (36<sup>1</sup>, 36<sup>2</sup>) which are first facing the runner plurality of a load pallet in the transporting direction before the last one are turnable, and the last intermediate board dog (36<sup>3</sup>) is an elongated second crossbar (39), or the like, attached transversely between the traction members (32<sup>1</sup>, 32<sup>2</sup>), between them, and which is disposed to push the runners ahead of itself; and that the intermediate board cassette (29) is disposed to deliver an intermediate board (3) into contact with said crossbar (39).

19. Apparatus according to any one of claims 15-18, characterized in that the deck board dogs (40) are pins (40) attached to the second crossbar (39); and that the deck board cassette (30) includes supporting flanges (41) for carrying the stack of deck boards, between said supporting flanges (41) being provided a slot (42) longitudinal to the cassette (30) which is disposed to receive the pin (40) in itself, this pin being disposed to push one deck board (4) per cassette at a time in its longi-

tudinal direction out from the deck board cassette (30), down upon the intermediate boards (3).

20. Apparatus according to any one of claims 1-19, characterized in that the nailing means (6<sup>2</sup>) comprises a clenching means (43) for bending back into the wood the deck nails that have been nailed through the deck and intermediate boards.

21. Apparatus according to claim 20, characterized in that the clenching means (43) comprises a bender plate (44) and a force member (45), such as a hydraulic cylinder, for moving the bender plate horizontally.

22. Apparatus according to any one of claims 1-21, characterized in that the nailing means entity (6; 6<sup>1</sup>, 6<sup>2</sup>) comprises

- a frame (46),
- an upper beam (47) which is vertically guided to be movable relative to the frame,
- force means (48), such as hydraulic cylinders, connected between the upper beam and the frame for producing the nailing stroke of the upper beam,
- a plurality of nailing rams (49), connected to the upper beam,
- a plurality of nail magazines (50), connected to the frame (46), and said magazine comprising a guide (51) for the nailing ram and a feed guide (52) for feeding nails to nailing standby for ramming,
- an intermediate nail store (53), and
- feeding means (54) for feeding nails from intermediate nail storage into the nail magazine.

23. Apparatus according to claim 22, characterized in that the nail magazines (50) are disposed to be movable in accordance with the nailing pattern.

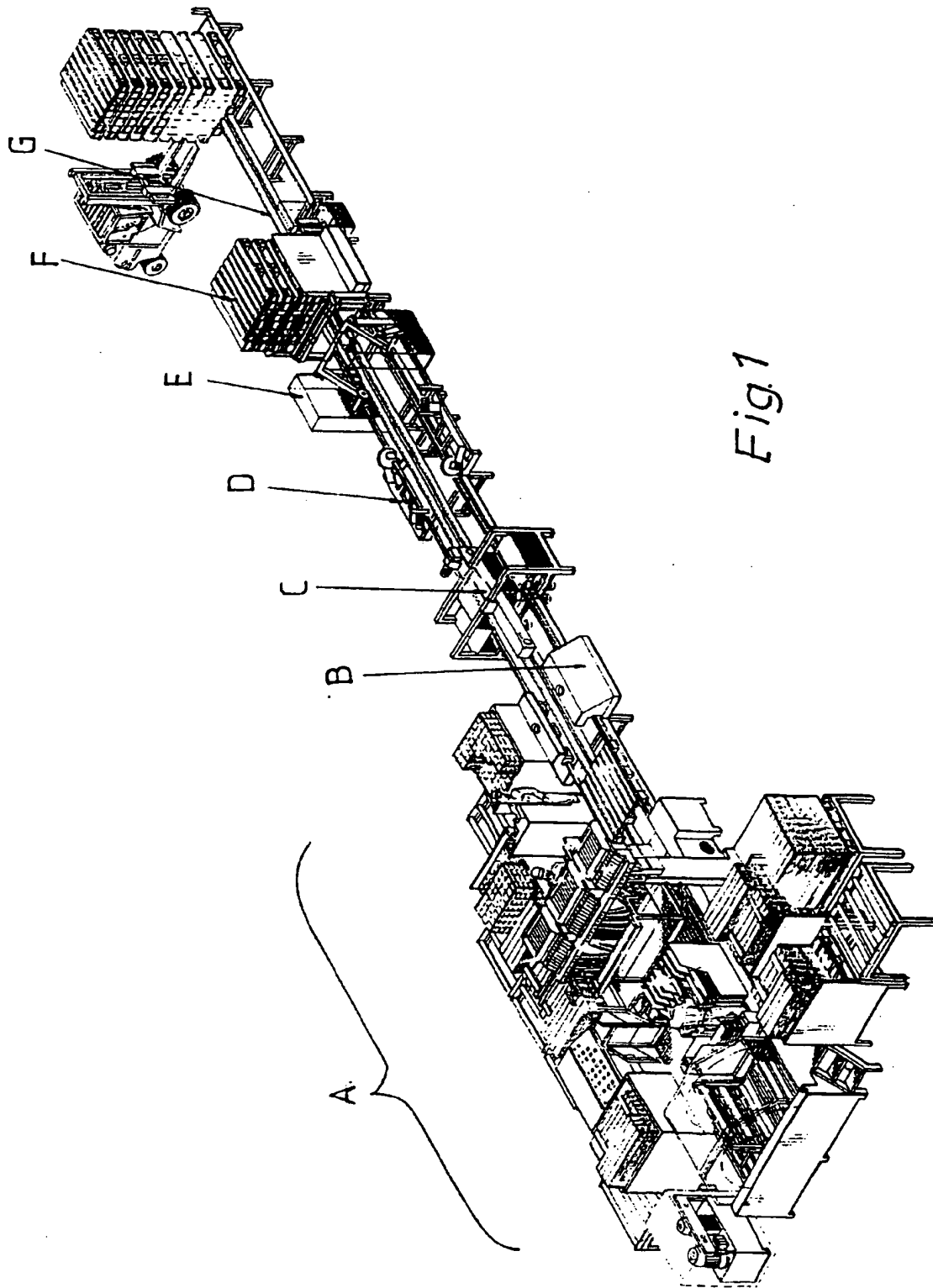


Fig. 1

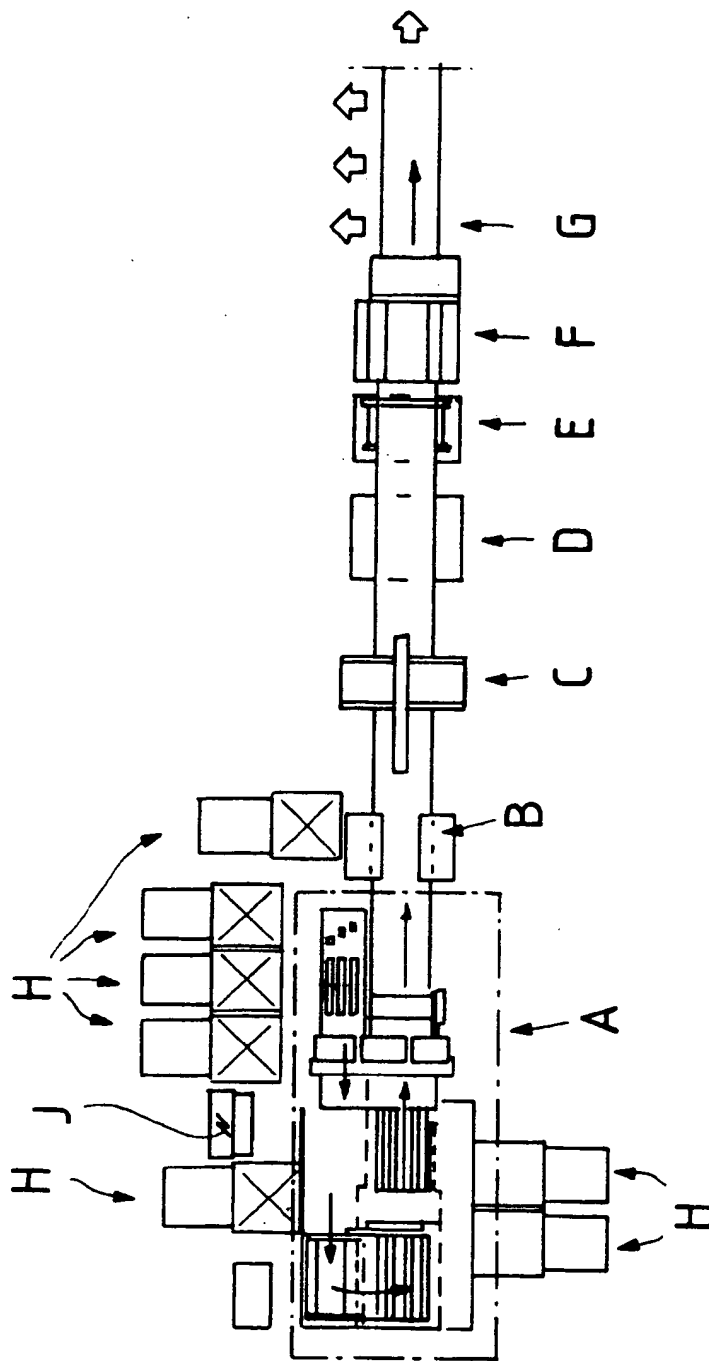
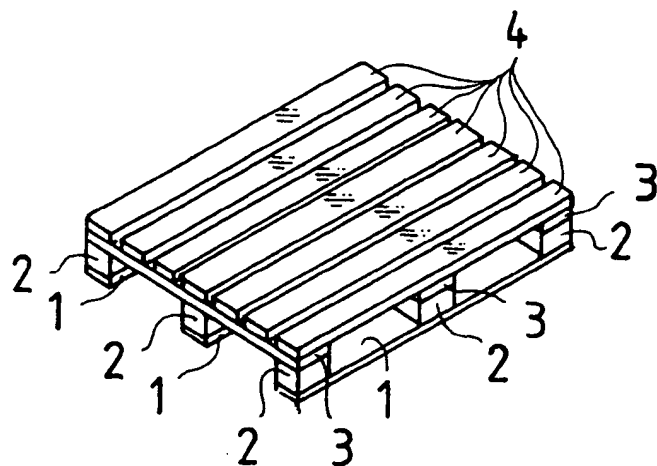
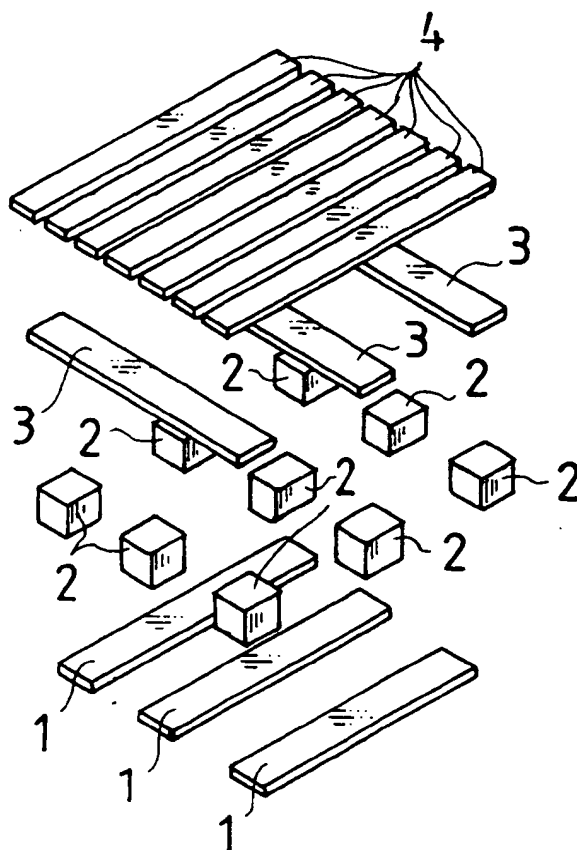


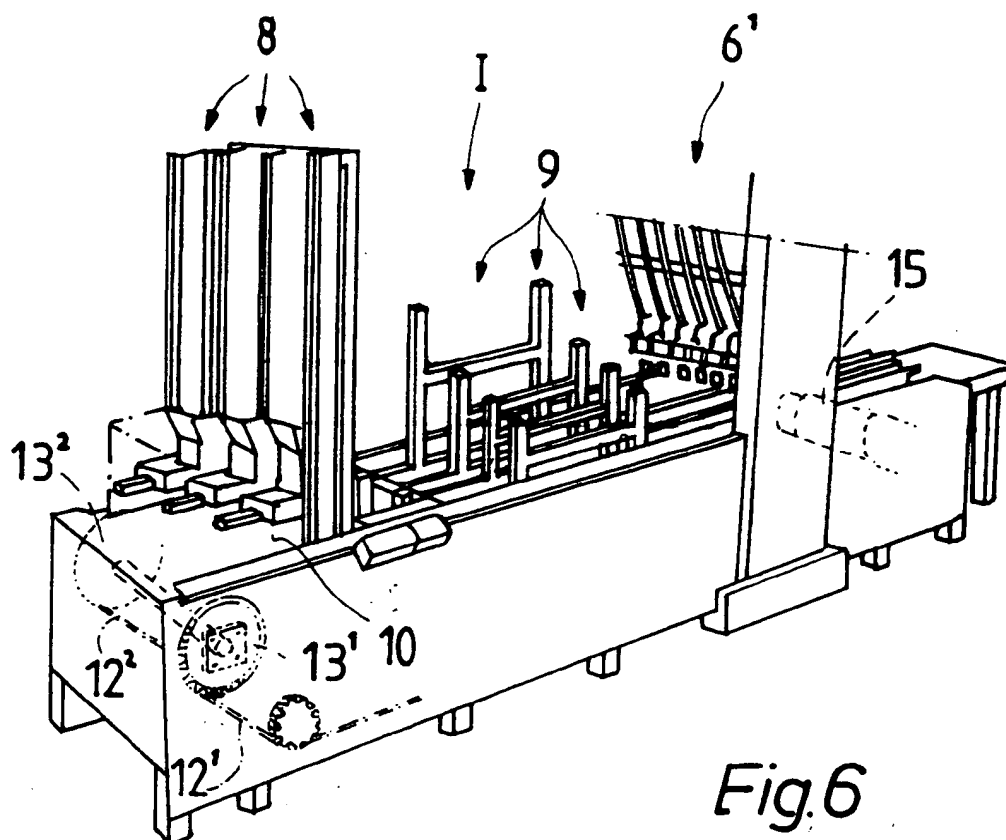
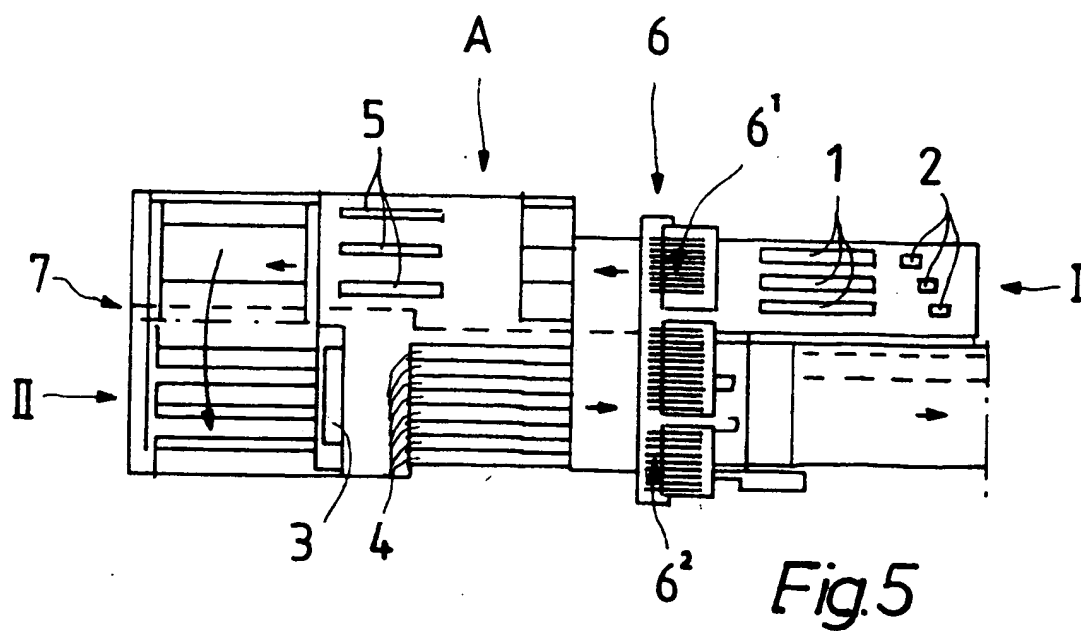
Fig. 2



*Fig. 3*



*Fig. 4*



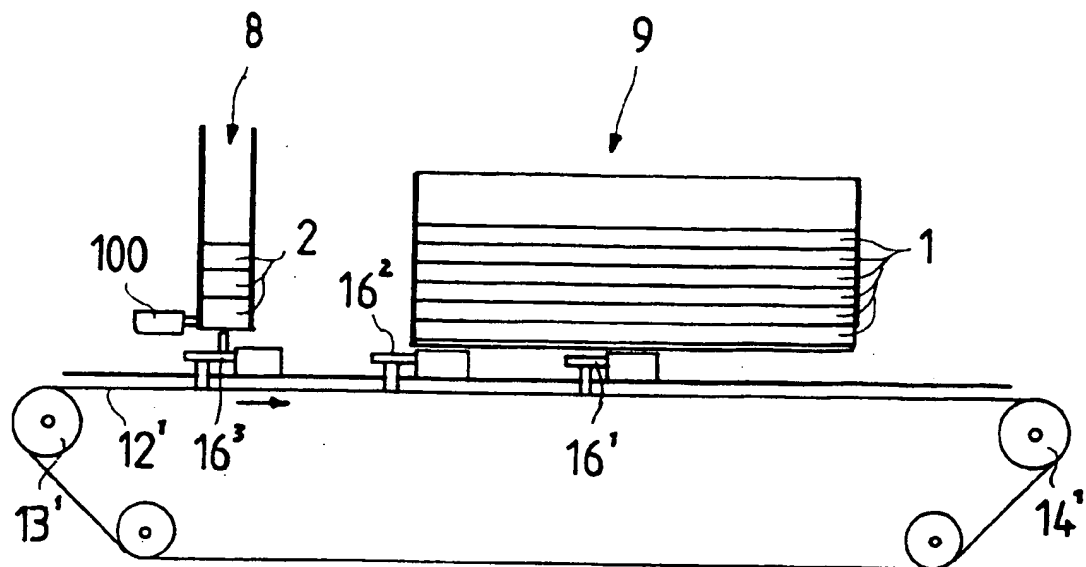


Fig. 7

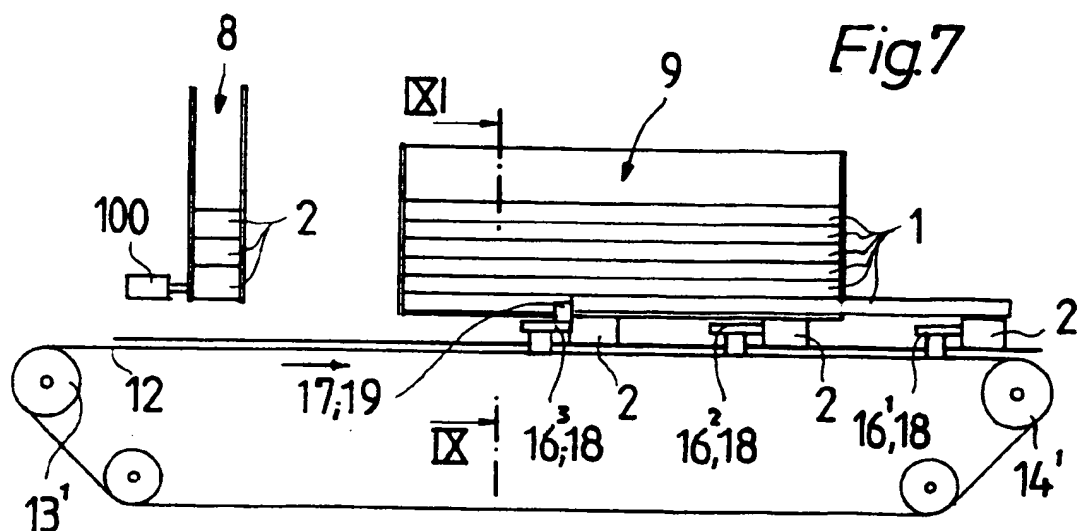


Fig. 8

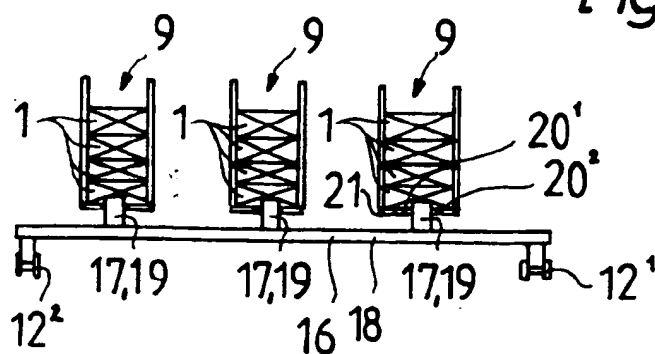
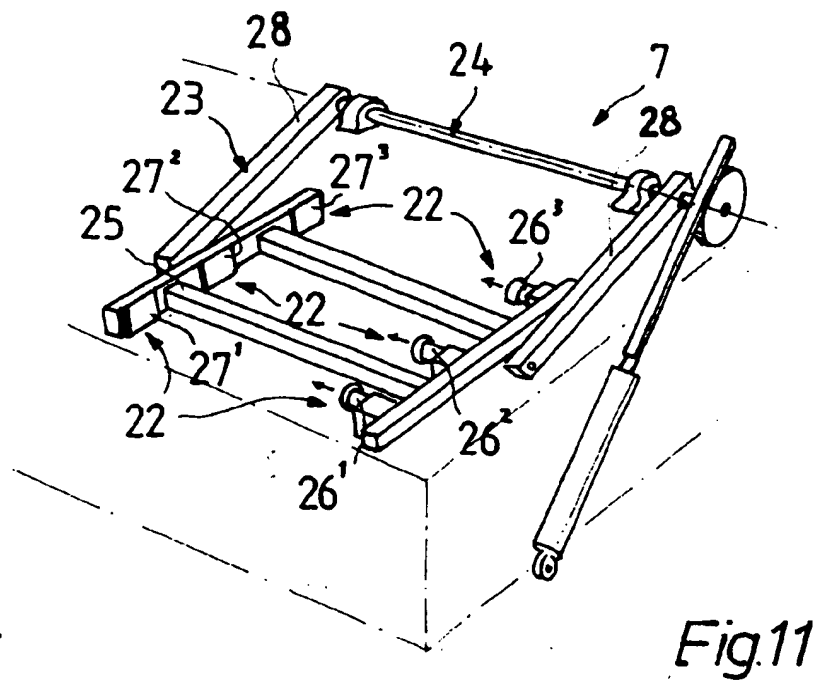
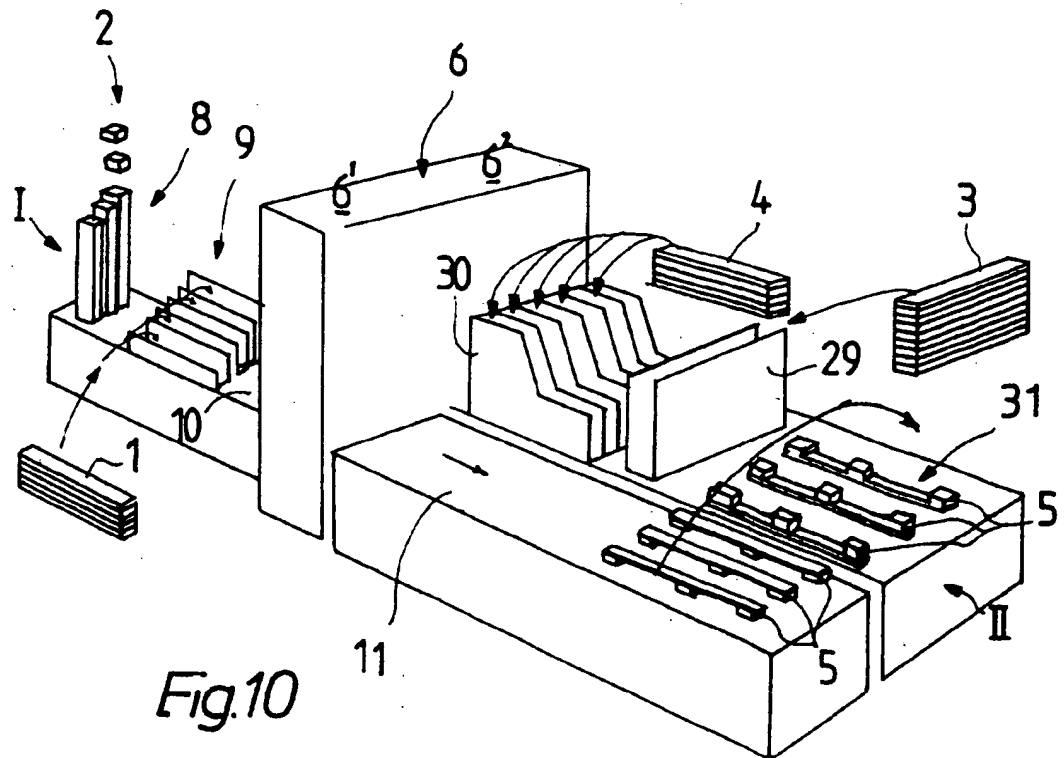


Fig. 9



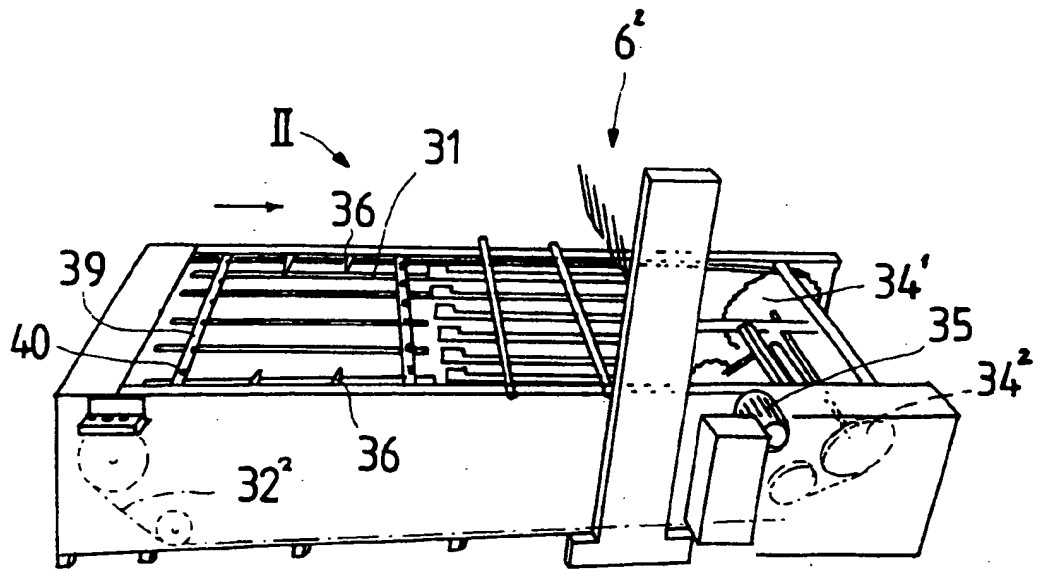


Fig. 12

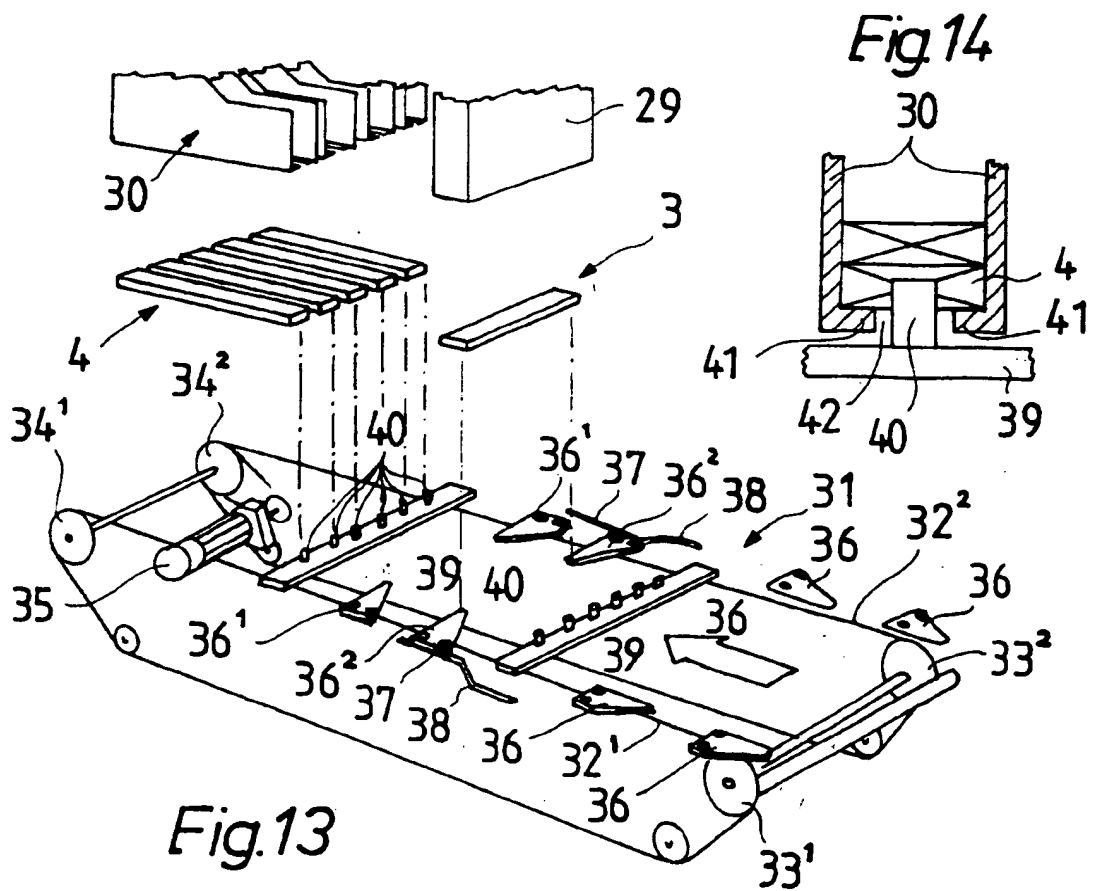
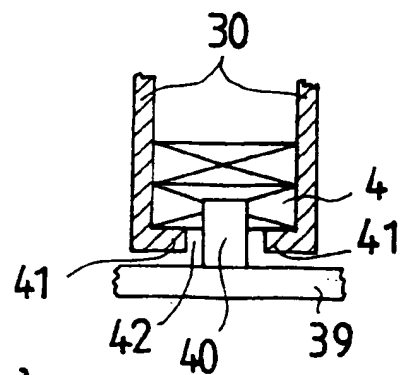


Fig. 13

Fig. 14





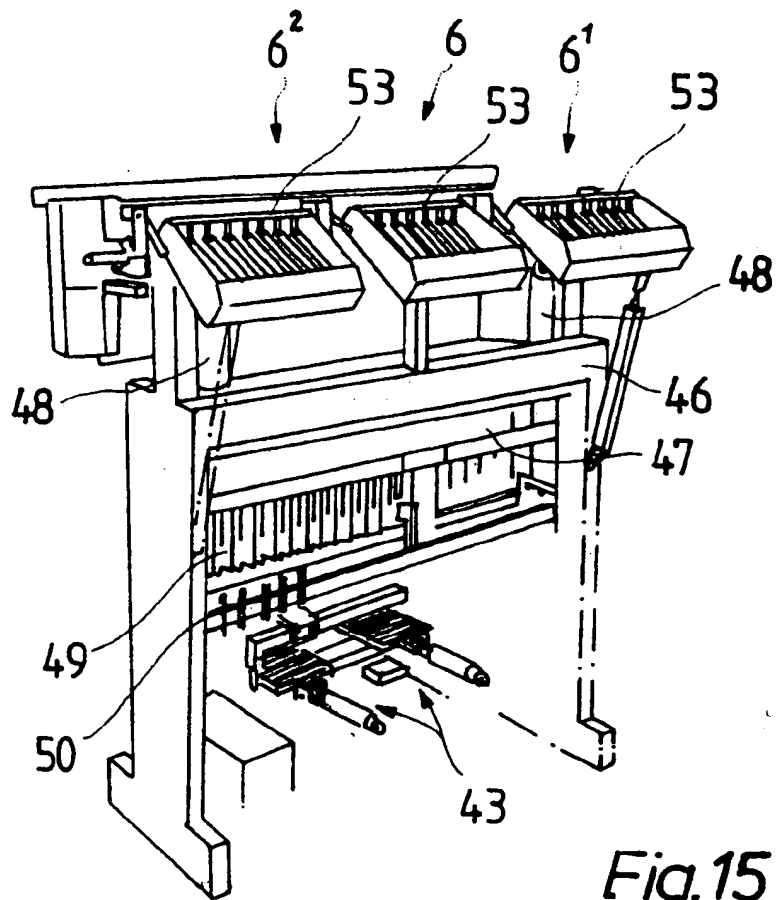


Fig. 15

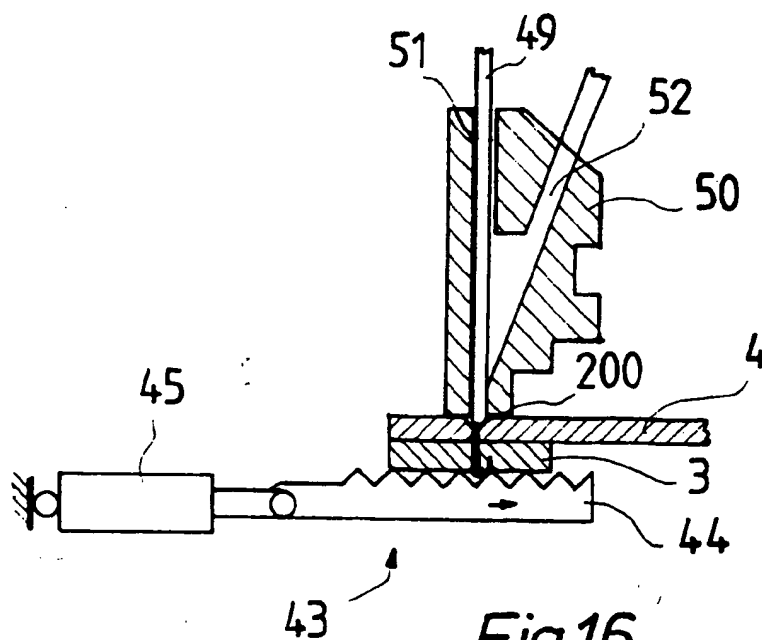


Fig. 16



European Patent  
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# EUROPEAN SEARCH REPORT

Application Number

EP 92 85 0103

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claims	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	US-A-3 968 560 (VIAL) * column 3, line 67 - column 4, line 64; figures 1A, 1B *	1	B27M3/00 B27F7/00
A	US-A-4 394 952 (CRANE) ---		
A	GB-A-1 215 674 (FMC) ---		
A	US-A-4 168 566 (STRECKERT) -----		
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			B27M B27F
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 19 AUGUST 1992	Examiner HUGGINS J. D.
<p><b>CATEGORY OF CITED DOCUMENTS</b></p> <p>X : particularly relevant if taken alone  Y : particularly relevant if combined with another document of the same category  A : technological background  O : non-written disclosure  P : intermediate document</p> <p>T : theory or principle underlying the invention  E : earlier patent document, but published on, or after the filing date  D : document cited in the application  L : document cited for other reasons  -----  A : member of the same patent family, corresponding document</p>			

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